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Scribneria, gen. nov.

AUCTORE E. HACKEL.

WITH PLATE V.

Tribus—Hordeæ, Benth & Hook. Gen. Plant. III. 1093.
Subtribus Leptureæ, Benth. & Hook. l. c. p. 1094.

Spiculæ unifloræ in spica simplici ad nodos haud excavatos rhacheos demum articulatæ solitariæ vel rarius versus basin spicæ binæ, altera tum sessilis, altera pedicillata, alternæ, angustæ, rhacheos faciei parelle insertæ, rhachilla brevissima supra glumas inferiores (steriles) articulata, ultra florem in stipitem brevem breviter penicellatum producta, floræ hermaphroditæ. Glumæ inferiores 2 vacuæ, collaterales, angustæ, rigidæ, acutæ, parum inequales, carina excentrica, ita ut latus anterior cujusvis glumæ 2-nervis, posterior enervis evadat. Gluma florens vacuis tertia parte brevior, membranacea, carinata, bidentata, ex incisura aristam rectam glumas vacuas superantem exserens, callo barbato. Palea illam subsuperans, tenuis, bicarinata, acute bidentula. Lodiculæ 2. Stamen unicum, anthera parva. Stigmata brevia, plumulosa, sessilia. Caryopsis linearis, a latere compressa, exsulca, embryone parvo, hilo punctiformi. Gramen annuum humile tenueque foliis angustis brevibus. Spica terminalis elongata rigida at tenuis, recta, subcompressa, spiculis subdissitis liberis (minime in excavationibus rhacheos inclusis).

Affinis *Lepturo* et *Kralikiæ* et *Psiluro*. *Lepturus* differt rhacheos internodiis excavatis, spiculis semper solitariis, gluma florifera integra mutica callo nudo, staminibus sæpissime tribus. *Psilurus* differt gluma vacua unica brevissima quam florens multoties breviore, hac ex apice aristata. *Kralikia*, quæ callo barbato convenit, differt spiculis bifloris rhacheos faciei oppositis, staminibus 3.

Dedicavi genus hoc F. Lamsonio Scribnero de graminibus americanis optime merito, qui primus discrimina inter hoc et Lepturi genus in litteris ad me indicavit.

Species unica: *Scribneria Bolanderi* Hack. (Lepturus Bolanderi Thurber in Proc. Amer. Acad. of Arts and Sciences VII. p. 401). California, Oregon.

EXPLANATION OF PLATE V.—Fig. 1. A plant, slightly reduced.
Fig. 2. A portion of the rhachis showing two spikelets in situ.
Fig. 3. The two spikelets, exterior view.
Fig. 4. The same, a view of the sides opposed to the rhachis.
Fig. 5. The empty glumes of these spikelets, anterior view.
Fig. 6. One of the spikelets with a short pedicel, exterior view.

Fig. 7. Same from the interior or the side next the rhachis.
Fig. 8. Flowering glume, with its palea, etc., removed from the outer glumes.
Fig. 8a. The short rhachilla which is prolonged behind the palea.
Fig. 9. The palea, dorsal view.
Fig. 10. The fruit, to which is attached by adnation a stamen, the anther of which is seen above.

Revision of North American Hypericaceæ.—II.

JOHN M. COULTER.

* * * Styles 3 or 4, very long, distinct and spreading, stigmas capitate: capsule ovate, strictly one-celled, a line or two long; seeds minutely striate and pitted: simple or branching herbs, 1 to 3 feet high, with small distant ascending sessile or clasping leaves, and the uppermost branches of the cyme bearing alternate distant flowers.

17. **H. virgatum** LAM. Leaves ovate or oblong-lanceolate, acute, half to an inch long, 2 to 4 lines wide: flowers bright yellow, 4 to 8 lines in diameter, in nearly naked cymes: sepals lanceolate to ovate, acute or acuminate, keeled below, more or less foliaceous and enclosing the small capsule.—Dict. iv. 158; Chois. in DC. Prodr. i. 547; Torr. & Gray, Fl. i. 166.

H. angulosum Michx. Willd. Spec. iii. 1453; Chois. l. c. 546; Torr. & Gray, l. c. 164 and 673; Gray, Manual, 85.

H. hedyotifolium Poir. Suppl. vii. 700.

Wet pine barrens of New Jersey, to Florida and Kentucky.

This species is exceedingly variable in the size of its leaves, but this is a characteristic of the whole genus, and has led to much confusion in attempting to construct species upon leaf characters. The broader-leaved, more northern forms are to be referred to the species, while associated with it at the south is

Var. **acutifolium.** Usually taller and more branching: leaves linear-lanceolate, tapering to a very acute apex, an inch or more long, a line or two wide.

H. acutifolium Ell. ii. 26; Torr. & Gray, Fl. i. 167.

18. **H. pilosum** WALTER. Scabrous tomentose, mostly simple: leaves ovate-lanceolate, usually appressed, 4 to 6 lines long, about a line or two wide, sometimes much reduced: flowers 3 to 5 lines in diamater, in few-flowered cymes: sepals ovate-lanceolate, acute: petals more than twice as long, involute when old.—Fl. Car. 190; Chois. l. c. 549; Torr. & Gray, Fl. i. 163.

H. setosum L. as to Clayton's plant in Gronov. Virg. 88.

H. simplex Michx. Fl. ii. 80; Chois. l. c.

Ascyrum villosum L. Spec. 788.

Wet pine barrens, South Carolina, to Florida and Louisiana.

**** Styles 3, long, distinct and usually spreading; stigmas capitate: capsule ovate, 3-celled, more or less glandular and exhaling a heavy odor when crushed; seeds as in the last: whole plant (including petals and anthers) more or less black dotted: herbs, with rather large leaves and flowers, the petals much longer than the sepals.

† Eastern species: plants 1 to 4 feet high: capsules mostly not lobed.

19. **H.** PERFORATUM L. Much branched: leaves linear to oblong, obtuse, mostly tapering at base, half to an inch long, 1 to 5 lines wide: flowers numerous in loose cymes, about an inch in diameter: sepals linear-lanceolate, very acute or acuminate: petals bright yellow, black dotted along the margin: capsule conical-ovate, 2 or 3 lines long.

Common everywhere in old fields as a weed difficult to extirpate. (Nat. from Europe.)

20. **H. maculatum** WALTER. Simple below, more or less branched above, conspicuously dotted all over: leaves oblong to lance-ovate, obtuse or acute, more or less clasping, sometimes tapering at base, 1 to 3 inches long, 4 to 9 lines wide: flowers smaller, 3 to 6 lines in diameter, crowded: sepals lanceolate to ovate, acute: petals pale yellow, with black lines as well as dots: capsule conical-ovate, 2 or 3 lines long.—Fl. Car. 189; Michx. Fl. ii. 80; Torr. & Gray, Fl. i. 161 and 673.

H. Virginicum Walter, 189.

H. punctatum Lam. Dict. iv. 164: Chois. in DC. Prodr. i. 547; Reich. Hort. Bot. i. 61, t. 88.

H. corymbosum Muhl. Willd. Spec. iii. 1457; Torr. & Gray, l. c. 160; Gray, Manual, 85.

H. micranthum Chois. Prodr. Hyper. 44, t. 5; Hook. Fl. Bor.-Am. i. 109.

From Canada and Minnesota to Florida and Texas.

This species is quite variable in the length of its styles, and upon the characters of short and long styles H. corymbosum and H. maculatum were formerly separated. This distinction, however, does not hold, as although the northern forms are mostly shorter styled the same forms are also found at the south associated with the longer styled forms. Besides it is only in extreme cases that the styles are very different in length, and there is every gradation between. The long styled forms of the south represent this species as formerly defined, which must now be made to include also H. corymbosum. The southern plants also usually have more glandular capsules.

21. **H. graveolens** BUCKLEY. Simple, or somewhat branched above: leaves large, elliptical-oblong, obtuse, closely sessile or clasping, 2 or 3 inches long, about an inch wide: flowers an inch or more in diameter, in few-flowered cymes: sepals lanceolate,

very acute: petals very scantily black dotted, if at all: capsule somewhat lobed, ovate, 3 to 5 lines long.—Am. Jour. Sci. I. xlv. 174; Gray, Genera Ill. i. 214, t. 92, Manual, 85; Chapm. Fl. 41.

Mountains of North Carolina.

†† Western species: plants 3 inches to 2 feet high: capsules 3-lobed, 3 or 4 lines long: petals bright yellow, often tinged with purple, with a few black dots along the margin.

22. **H. formosum** HBK. var. **Scouleri.** From running root-stocks, simple or somewhat branching, often with numerous small branchlets, a half to two feet high: leaves ovate-oblong, obtuse, more or less clasping, about an inch long, half inch or more wide (those of the branchlets much smaller and often tapering at base), usually black dotted along the margin of the under surface, veiny: flowers half to an inch in diameter, in loose corymbs: sepals lanceolate to ovate, obtuse or acute: styles mostly erect.

H. Scouleri Hook. Fl. Bor.-Am. i. 111; Torr. & Gray, Fl. i. 160; and of all authors.

Throughout all our western mountain systems, and extending into British Columbia.

Exceedingly variable. The species is Mexican, and differs from our variety only in its narrower and acuminate sepals. It is really questionable whether our forms deserve to rank even as a variety, as there are found among them sepals which are almost indistinguishable from those of H. formosum.

23. **H. concinnum** BENTH. Somewhat shrubby and branching at base, 3 to 18 inches high: leaves linear to oblong, not clasping, usually folded, half to over an inch long, 1 to 4 lines wide, acute: flowers over an inch in diameter, few, in rather close clusters at the summit of the stem, with black lines as well as dots: sepals ovate, mucronate-acute, or very acuminate, longer than the capsule.—Pl. Hartw. 300; Brewer & Watson, Bot. Calif. i. 81.

H. bracteatum Kellogg, Proc. Calif. Acad. i. 65.

California. First collected by *Hartweg*, in the "Sacramento Valley."

§3. Stamens 5 to 20, mostly in 3 clusters: styles 3 (sometimes 2), short, distinct; stigmas capitate: capsules ovate to conical, one-celled; seeds yellow, more or less striate and pitted: small and slender annuals, with very small flowers, and petals shorter than the sepals.

* Procumbent or ascending, or forming dense mats, diffusely branching: leaves rather broad, obtuse, clasping: capsule a line or two long.

24. **H. anagalloides** CHAM. & SCHLECHT. Often forming dense mats: stems an inch to a foot long: leaves oblong to broadly ovate, very obtuse, 5 to 7-nerved at base, 2 to 6 lines long, almost as broad: flowers 3 or 4 lines in diameter, in few-flowered naked or leafy cymes: sepals foliaceous, unequal, lanceolate to broadly ovate, longer than the ovate capsules: stamens 15 to 20.—Linnæa, iii. 127; Torr. & Gray, Fl. i. 167 and 674.

? *H. mutilum* Watson, King's Report, v. 46.

In wet ground from Southern California to Washington Territory, Montana (*Watson*), and British Columbia. Also in adjacent Mexico.

Possibly this is but a form of *H. Japonicum* Thunb.

25. **H. mutilum** L. Like the last, but more erect and diffusely branching, a half to a foot (or even two feet) high: leaves narrowly oblong to somewhat ovate, half to an inch long, 2 to 4 lines wide, 5-nerved at base: flowers in very loose leafy cymes: sepals linear to lanceolate, usually shorter than the ovate capsule: stamens 6 to 12 —Spec. 787; Torr. & Gray, Fl. i. 164.

H. quinquenervium Walter, Fl. Car. 190; Chois. in DC. Prodr. i. 550; Hook. Fl. Bor.-Am. i. 110.

H. parviflorum Willd. Spec. iii. 1456; Pursh. 377.

H. stellarioides HBK. Nov. Gen. v. 196.

Low grounds, from Canada to Florida and Texas. Also in adjacent Mexico.

Quite variable in size, and in some forms closely resembling the last species.

** Almost simple, with strict stems and branches: flowers in naked cymes: sepals linear to linear-lanceolate, acuminate.

26. **H. gymnanthum** ENGELM. & GRAY. A foot to three feet high: leaves cordate-ovate, clasping, often quite distant, half inch or more long, 5 to 7-nerved and 3 to 5 lines wide at base, tapering to an acute or obtuse apex: flowers in strict mostly few-flowered elongated cymes: sepals a line or two long, about as long as the ovate-conic capsule: stamens 10 to 12.—Pl. Lindh. 4; Walp. Ann. ii. 188.

H. mutilum var. *gymnanthum* Gray, Manual, 86.

Delaware, Pennsylvania and Illinois, to Louisiana and Texas.

The strict habit and naked cymes resemble the following species. In the *Berichte der Deutschen Botanischen Gesellschaft* for Feb. 1885, R. v. Uechtritz and P. Ascherson refer this species to *H. Japonicum* Thunb. They well establish it as a species distinct from H. mutilum, but an examination of many specimens of H. Japonicum shows it to be very distinct from that species also. If H.

Japonicum is represented in our flora at all, it is our western H. anagalloides. This last named species approaches very nearly our eastern H. mutilum, to which species H. gymnanthum has been referred. This is the closest relationship we can trace between H. Japonicum and H. gymnanthum. If these two are one, then must H. mutilum and H. anagalloides follow, and with such a limitation our species of Hypericum could be reduced to very few.

27. **H. Canadense** L. A half to a foot or more high: leaves linear to linear lanceolate, glandular dotted beneath, mostly tapering to the sessile 3-nerved base, half to an inch or more long, a line or two wide: flowers in loose cymes: stamens 5 to 10: capsule very acutely conical, 2 or 3 lines long, longer or shorter than the sepals.—Spec. 785; Torr. Fl. N. Y. 1. 89; Torr. & Gray, Fl. i. 165.

H. thesiifolium, *pauciflorum* and *Moranense* HBK. Nov. Gen. & Spec. v. 192 and 193.

Wet sandy soil, from Canada to Georgia, Illinois, Wisconsin, and the Winnipeg valley.

Exceedingly variable in size. The extreme forms may be grouped under the following varieties:

Var. **major** Gray. Stems much stouter and taller: leaves larger, an inch or two long, 4 to 6 lines wide, lanceolate, more or less clasping, often very acute: flowers in larger more crowded cymes: sepals long pointed: capsules larger.—Manual, 86.

From Canada to Pennsylvania, Illinois, and about the Great Lakes.

Var. **minimum** Chois. Dwarf, 1 to 3 inches high, simple, few-flowered: leaves oblong, obtuse, 4 to 5 lines long, a line or two wide, smaller and more crowded below.—DC. Prodr. i. 550; Hook. Fl. Bor.-Am. i. 110.

On wet rocks, Canada, to Wisconsin (*Lapham*), and "Cypress Hills," N. W. T. (*Macoun*).

* * * Bushy branching, with rigid erect black-dotted stems and branches: leaves very slender and rigid or minute, erect or appressed: flowers scattered along the upper part of leafy branches.

28. **H. Drummondii** Torr & Gray. Stem and alternate branches rather stout, 10 to 30 inches high: leaves linear-subulate, erect, a fourth to an inch long, one-nerved: flowers pedicellate: stamens 10 to 20: capsule ovate, about 2 lines long, not longer than the sepals; seeds large, oval, strongly ribbed and transversely lacunose, brownish yellow.—Fl. i. 165.

Sarothra Drummondii Grev. & Hook. Bot. Misc. iii. 236, t. 107.

In dry soil, Georgia and Florida, to Illinois and Texas.

29. **H. nudicaule** WALTER. Stem and opposite branches foliform, wiry, appearing naked from the very minute awl-shaped appressed leaves, 4 to 20 inches high: flowers very small, mostly sessile: stamens 5 to 10: capsule very acutely conical, 1 to 3 lines long, much longer than the sepals; seeds very much smaller, oblong, minutely striate and pitted, light yellow.—Fl. Car. 190.

H. setosum L. Spec. 787, as to Pluck. syn.

H. Sarothra Michx. Fl. ii. 79; Torr. & Gray, Fl. i. 165; Gray, Gen. Ill. i. 214, t. 93, f. 1–7, Manual, 86.

Sarothra gentianoides L. Spec. 272; Lam. Ill. t. 215, f. 1.

S. hypericoides Nutt. Gen. i. 204; Barton, Fl. N. Am. iii. 59, t. 92, f. 1.

Dry sandy soil, Canada to Florida, and the Mississippi valley.

3. ELODEA JUSS., PURSH.

Perennial herbs, in marshes or shallow water; with small close clusters of flesh-colored flowers in the axils of the leaves and at the summit of the stem; sepals much shorter than the acute capsules.—Juss. Gen. 255, partly; Pursh. Fl. 360; Torr. & Gray, Fl. i. 167; Gray, Gen. Ill. i. 216, t. 94. Not *Elodes* Adans., Spach, nor *Elodea* Michx. *Triadenium* Raf.—A genus of two species, peculiar to Eastern North America.

1. **E. campanulata** PURSH. A foot or two high, mostly simple: leaves oblong to ovate, very obtuse or emarginate, clasping by a broad base, about an inch and a half long, half inch wide, glaucous beneath and black dotted: axillary flower clusters at the ends of elongated branches: sepals lanceolate to ovate: filaments united below the middle: capsule 4 or 5 lines long.—Fl. 379.

E. Virginica Nutt. Gen. ii. 17; Torr. & Gray, Fl. i. 167; Gray, Gen. Ill. i 216, t. 94; Manual, 86.

Hypericum Virginicum L. Spec. 2 ed. 1104; Chois. in DC. Prodr. i. 546.

H. campanulatum Walter, Fl. Car. 191.

H. emarginatum Lam. Dict. iv. 154.

From Hudson's Bay to New Jersey and North Carolina, westward to Minnesota and the Winnipeg valley. Also in adjacent Asia and Japan.

2. **E. petiolata** PURSH. Resembling the last, but usually taller and more branching: leaves longer (2 to 5 inches), half to an inch wide, tapering to a sessile base or petioled, not so glaucous or black dotted beneath: axillary flower clusters almost

sessile: filaments united about to the middle.—Fl. 379; Torr. & Gray, Fl. i. 168.

E. tubulosa Pursh (*Hypericum tubulosum* Walter) has not been identified, but is probably this species, from which it differs only in its "tubular corolla," concerning which there must have been some mistake; see Torr. & Gray, Fl. i. 168.

Hypericum petiolatum Walter, Fl. Car. 191.

H. axillare Michx. Fl. ii. 81.

H. paludosum Chois. in DC. Prodr. i. 546.

From Virginia to Florida, Louisiana, and Arkansas.

A Trip to Willoughby Lake, Vt.

WALTER DEANE.

The region about Willoughby Lake, Vt., is so rich in interesting flowering plants and ferns that a short account of my visit there, during the latter half of July, 1885, may be of interest to botanists.

I arrived there with my wife and Judge J. R. Churchill, of Dorchester, Mass., an enthusiastic botanist, on the evening of July 18th. A pleasant ride of about eight hours in the cars from Boston, on the Boston & Montreal Air Line, brought us to West Burke, on the Passumpsic railroad, where we left the cars and took stage for the Willoughby Lake House. The ride of six miles, through a hilly country, over a rough road, was quite refreshing, for the air was clear and bracing, and, during our stay of two weeks, we were never oppressed by the heat.

Willoughby Lake lies in the northern part of Vermont, in the township of Westmore, between Willoughby mountain on the east, and Mt. Hor on the west.

The lake, which runs north and south, is six miles long and from half a mile to a mile and a half broad. Its surface is about 1200 feet above sea level. It empties into Lake Memphramagog through Willoughby river, and from there finds its way into the St. Lawrence river. The Willoughby Lake House, at which we stayed, stands at the head of the lake and commands a magnificent view, especially when the sunset clothes the towering cliffs on Willoughby Mt. with a rosy hue. The country is well wooded, even to the summit of the mountains, with the usual trees and shrubs that prevail in this section. Prominent among them were Tilia Americana, Acer saccharinum, Acer rubrum, Acer Pennsylvanicum, Acer spicatum, Fraxinus Americana, Frax-

inus sambucifolia, Ulmus Americana, Fagus ferruginea, Betula papyracea, Betula lutea, Populus tremuloides, Populus grandidentata, Thuja occidentalis, Picea alba, Picea nigra, Tsuga Canadensis, Abies balsamea, and Larix Americana.

Alnus viridis was very abundant, while, in the bogs, was found Ledum latifolium, and Rhamnus alnifolius, the latter with its black berries, bearing a close resemblance to the buckthorn, Rhamnus catharticus, of our hedges.

One of the first expeditions was to the ledges on the steep sides of Willoughby Mt., whither I had often wandered in fancy, as I read in the Manual of "Arabis petræa, Willoughby Mt., Vermont, H. Mann," "Primula Mistassinica, Willoughby Mt.," and I longed to see and collect the plants for myself.

The cliffs of Willoughby Mt. rise sheer and straight for many hundred feet above the lake and their base is only reached by a hard scramble of about an hour's duration, up a very steep ascent over bowlders and fallen trees and, in places, through a dense undergrowth. This slope is heavily wooded from the water's edge almost to the very base of the cliffs. Land slides are not infrequent, and it is easier to climb up their rocky beds over the loose rocks and crumbling stones than to push through the woods. In the rich soil at the base of the mountain we found Allium tricoccum, in full flower, in abundance, and Monotropa Hypopitys was frequently met with, pushing its creamy-white flowers and stems through the rich leaf-mould under the trees. Pushing our way up one of the "runs", as the bare paths, left by the slides, are called, we passed abundance of Asprella Hystrix, Elymus Canadensis, and Muhlenbergia Mexicana, growing among the rocks, and, on nearing the top of the slope, we found Rosa blanda covering the rocks in great profusion, interspersed with Astragalus alpinus, in full fruit. Arrived at the foot of the ledges, a new field was opened out before us. Above us towered the bold, bare, threatening cliffs, so steep that, should a stray bowlder loosened from above come tumbling down (an event which often happens), I felt that by pressing against the rock, I could avoid it. More than once that morning we heard the ominous falling of rocks from the cliffs across the lake. Small streams from above, trickling down the ledges, keep them wet. In the chinks and crevices within our reach and too often, to our disappointment, far beyond, grows a rich and attractive flora.

Scattered here and there on the dripping ledges were bright yellow patches of the beautiful yellow mountain saxifrage, Saxifraga aizoides, while its near relative, the little Saxifraga oppositifolia modestly clothed the rocks with its small patches of

green. Its open pods were all that was left of its fruit. We found this plant much more abundant on the cliffs of Mt. Hor. The pretty little Primula Mistassinica was growing everywhere in the wet chinks of the rocks. The time to gather this plant in flower is early in June, but we secured as many specimens in fine fruit as we cared to take away. The withered corolla was still covering the well-developed capsule, which, with the scape, was bright yellow, contrasting strangely with the bright, green leaves.

The most interesting of the twenty-seven species and varieties of the genus Carex that we found and collected during our visit, was Carex scirpoidea, which grew here in great profusion on the rocky slope, as well as on the cliffs of Mt. Hor. Both sterile and fertile spikes were equally abundant. Though the sedge itself is not very striking in appearance, yet, when collected properly, with its root-stock and base leaves, it makes a handsome specimen. It is rather difficult to get the plant up by the roots, and botanists are apt to leave them behind. Carex Oederi was also very abundant, varying in height from three to eight inches. The only other cyperaceous plant that we found here was Rhynchospora capillacea. Erigeron hyssopifolius and Calamagrostis stricta were interesting features of this locality.

I must not forget the Hedysarum boreale, with its pretty purple flowers and jointed pods. It seemed to be well aware of its great attraction to botanists, for most of it was growing defiantly far above our reach. The Arabis petræa, which we had particularly desired to find, was abundant everywhere on the same dry slopes where Horace Mann found it in 1862. It was past flower, however, and its long slender pods had burst and were freely scattering their seeds. I collected several specimens of Potentilla fruticosa, which, on these bold exposures, we rarely found more than a foot high. But the day, at length, was drawing to a close, and with our presses and boxes well filled we reluctantly descended the mountain and returned to the hotel.

Our trip, the next day, was to the cliffs on Mt. Hor, on the western side of the lake. It was here that I realized, for the first time, a fact which I had often heard before, that the Willoughby Lake region was famous for its ferns. Here they were in the deep woods, in the wildest profusion, even the common species wearing a most attractive appearance, from their freshness and fine development. Aspidium aculeatum, var. Braunii, grew abundantly in the deep shade below the cliff, with its circlet of gracefully curving fronds, which were sometimes three feet long. We passed through beds of Adiantum pedatum, and amongst the moss-grown bowlders near the water were magnificent specimens

of Phegopteris Dryopteris, P. polypodioides, and Aspidium spinulosum, var. intermedium, while everywhere was the common Polypodium vulgare. Our most interesting finds, however, among the ferns, were growing in the wet crevices of the cliffs, carefully hidden by the overhanging rock and sheltered by the trees. These were Pellæa gracilis and Woodsia glabella. We found both of these ferns afterwards in other localities, but nowhere in such abundance as here. The little Pellæa had hidden its delicate rootstocks so deep down between the narrow chinks that it was difficult to procure full specimens. With care, however, we succeeded in procuring all we wanted. We found essentially the same flora on these cliffs as on the Willoughby ones, though the various species seemed to differ in relative abundance. We added to our collection here Draba arabisans, Impatiens pallida, Trisetum subspicatum, var. molle, and Microstylis monophyllos. M. ophioglossoides we found afterwards in abundance on the dry sunny hillside near the hotel. This latter plant I have often found in Shelburne, N. H., and always in similar locations. The "ostrich-fern," Onoclea Struthiopteris, was growing rank by a running brook, while the little Equisetum scirpoides was in full fruit, covering the wet turf by the edge of the water. We reached home, this day, in time for dinner, but found plenty to do during the rest of the afternoon in laying away our plants.

One day we made an expedition over Willoughby Mt., and we were well rewarded with magnificent views and full presses. Here again the ferns were everywhere. It is not so much of their variety that I speak, though we counted thirty different kinds, as of their omnipresence. They greeted the eye at every step from the coarse Pteris aquilina by the roadside, to the graceful Cystopteris bulbifera in the damp woods. I was struck with the strong, sweet fragrance of the latter. I have collected Aspidium fragrans in abundance in Shelburne and Gorham, N. H., but its fragrance did not compare with the delicious odor of the "bladder fern." Aspidium Goldianum was abundant near the foot and on the summit of the mountain, but it was difficult to find perfect fronds owing, as it appeared, to the attacks of some insect. Half way up the mountain, which is about 2,500 ft. above the level of the lake, is a bold rock projecting over the cliff beyond the trees, whence a fine view is obtained. It is called "pulpit rock" and is an interesting botanical locality, for here we found plenty of Draba incana, and Clematis verticillaris in fruit, with Solidago bicolor, var. concolor, just coming into flower. The trees on the summit of the mountain do not differ from those below, though they are somewhat stunted. We took one bunch

in the warm sunshine, near abundance of Carex canescens, var. alpicola, which was growing in dense tufts. I was surprised to find Muhlenbergia glomerata, which is credited in the Manual to bogs, growing here among the dry rocks. Farther down in the woods we found Viola pubescens, with its variety eriocarpa, and V. Canadensis, in various stages of fruit and flower. After descending the mountain we walked back through the woods along the shore of the lake. Fragaria vesca and F. Virginiana, were both abundant along the roadside, and we had a good opportunity to observe the differences between the two species. The thin, light green leaves and small fruit with superficial achenia of Fragaria vesca make it easily distinguishable from the other species, with its much darker leaves and imbedded achenia. I had not realized that the fruit of the two species presented such a different appearance. The fruit of Fragaria vesca is very insipid to the taste, as compared with F. Virginiana.

A small muddy pond and a bog behind the hotel well repaid more than one visit. Naias flexilis and Chara intermedia cover the bottom of the pond, while its margin is lined with many interesting plants, among others, Lobelia Kalmii, Habenaria obtusata and H. hyperborea.

Our two weeks sped quickly by and we were obliged to leave this enchanting spot just as the asters, solidagos and other composites were coming into bloom. My object in this short sketch has been, not to enumerate all, or nearly all, of the interesting plants that we found in this locality, or to tell anything new, but to show what a rich botanical field lies within easy reach of all who have the leisure and the desire to visit Willoughby Lake.

BRIEFER ARTICLES.

Notes on Eatonia.—Having recently made some investigation into the genus Eatonia, I wish to call the attention of botanists to such forms of that genus as they may meet with. The indications are that there are several new species or very marked varieties, of which I think the two following may be well separated as species:

1. Eatonia Dudleyi.—Culms 2 to 2½ feet high, very slender: cauline leaves only 1 or 2 inches long, abruptly acute, spreading; the radical ones 3 to 6 inches long: panicle slender, nearly linear, 3 to 6 inches long, the branches few and mostly appressed: upper empty glume obovate, obtuse, broadly scarious on the margins, smoothish; the lower glume broader than in E. Pennsylvanica, and nearly as long as the flower next above it; flowering glumes linear-oblong, obtuse or abruptly acute, the second one hispidulate. Grows in open

dry woods, from Michigan to Long Island, and Pennsylvania to North Carolina.

Easily distinguished from E. Pennsylvanica by the slender culms and panicles, the very short cauline leaves, the longer and wider lower glume, the more obtuse and shorter upper glume, and the shorter obtuser flowering glumes.

2. EATONIA FILIFORMIS—*E. Pennsylvanica*, var. *filiformis* Chapman. Very well characterized by Dr. Chapman in the Flora of the Southern States. It is easily distinguished by the very long filiform leaves, slender culm and panicle, short obtuse flowers, and very obtuse smoothish upper glume. Florida to Texas.

There are several varieties of E. Pennsylvanica and of E. obtusata, and in Louisiana there is a peculiar form with often 3-flowered spikelets, the flowering glumes acuminate and sometimes mucronate.—GEO. VASEY.

On the characters of species in Cacti.—Just what are good characters or not for distinguishing species of Cactaceæ is worthy of study. As the species are so difficult to determine in herbaria, I try to get living specimens and watch their growth. Some two years ago I had sent to me by a stranger in Texas a plant which he called Mammillaria applanata, with a hint that if I sent money and trusted to him, he would send living plants of the cacti of that region to the value thereof. I sent five dollars, but have never had cactuses, or answers to letters since. Though my plant, therefore, cost me five dollars, it seemed to agree pretty well with Engelmann's description in *Pl. Lindheimeriana*, of M. applanata. Haage & Schmidt of Erfurt, in the midst of men who know cacti, sent me another as M. applanata. Dr. Engelmann, in *Botany of Mexican Boundary*, speaks of his M. applanata and M. hemisphærica as being after all but "different forms" of M. Heyderi, Muhlenpf. Now M. applanata, as described by Engelmann, is "depressed," with yellowish lobes to the stigma, and yellowish stamens. M. hemisphærica is "hemispherical," with yellowish-red stigma-lobes, and reddish stamens. Now this last suits my German specimen, and it should be that "form," but Engelmann says it has much fewer and shorter spines than the "form" applanata; but this has just as many and just as long, but they are so slender that they might be termed cilia, and they are slightly recurved. The other, which being depressed might be applanata, has stiff and rather lighter spines. The plant is about three inches high by four wide; the hemispherical one about four by six. The tubercles in the depressed one are so close together that we can note no fleecy wool in the axils, while in the other they are all distinct, and the little mass of wool is plainly seen. In the depressed form the flowers are so comparatively short that they can not expand fully, through the interference of the spines; in the other they are longer, so long that the petals spread over the bundles of spines, and when in full sunlight give the plant quite a gay appearance. So far as we usually judge of species among cacti, we have characters for two good species. Outside of this are characters not mentioned by Englemann. Supposing the depressed one to be M. applanata, the lobes of the stigma are green, not yellow, and about two lines long. The lobes of M. hemisphærica (?) are four lines long.

But there is a something almost indescribable by which the student of cacti can class the "forms," and as these are now blooming before me to-day in my

greenhouse (March 6th) he would say "these are all one." The florist would want to keep them separate, and give them separate names, for the rounder one is by far the most showy. The forms of the same species open their flowers almost simultaneously. Flowers on different plants will open on almost the same day of the month. Then again the numerical order in which they appear in the axils of the tubercles is a good specific point. Counting from the uppermost tubercle on which the bundle of spines seems fully formed, and following the spiral down, the flowers will sometimes come from the axil of the second, or of the third, the fourth, or the fifth. Sometimes there will be two circles of flowers. In this Heyderi and "forms" there are three circles, from the second, third, and fourth.

The point I desire to make in this note is that cacti are not only hard to determine, but harder than we have been led to believe them; that in all probability characters that we have depended on as distinguishing, are of less value than has been assumed; and that those who find new "forms" should hesitate considerably before loading science with a heavy burden of synonyms. There was one special lesson of interest from the study of these two forms of Mammillaria. Everyone knows that the fronds or joints in Opuntia are not always of uniform shape on the same plant. One generally with an almost orbicular section will sometimes have sections much elongated. I have noted on Opuntia Rafinesquii, that when the frond is elongated, the ovarium is elongated and the petals are more slender. Elongation goes through the whole morphological course. This experience is repeated here; the more elongated plant has longer and more slender sepals and petals, and longer and more slender stigma-lobes.

THOMAS MEEHAN.

EDITORIAL.

IT IS TIME for botanists to be looking forward to their meeting at Buffalo next August. Those who were present at Ann Arbor can bear testimony that they spent a delightful time together, that they were stimulated in their work, and that the year that has elapsed since has felt the constant influence. The personal friendships formed at such a time are not only pleasant to remember, but exceedingly profitable. As Buffalo is more centrally located, and as there are many botanical reminiscences connected with it, we expect even a larger attendance than at Ann Arbor. The Botanical Club has grown into a very vigorous life, not so much on account of its organization, for it has none, but on account of its informality, the strong bond holding it well together being a community of sentiment. As many botanists will come to Buffalo with the warm feelings aroused by the companionship of the last few years, and as there is an active local botanical society, we may all expect a week of great enjoyment and profit. Arrangements will be made for meetings and excursions, and abundant opportunity given for talks in the herbarium and in the field. We bespeak thus early a large attendance, that plans for the summer may be made to include a week at Buffalo, beginning August 18. One feature of the Club meetings can be spoken of now. The June GAZETTE will be an herbarium

number, devoted to the collection and preservation of plants, but it is found almost impossible to describe portfolios, presses, cabinets, etc., so as to be well understood, without taking too much space. Therefore, at the coming meeting, an evening will be set apart for an exhibition of the appliances of botanical work, such as portfolios, presses, the most effectual poison, the best mode of glueing, the quality, size and cost of genus covers and herbarium sheets, the best size and form of labels, the best form of cabinets for security of contents and ease of referring to them, etc., etc. As botanists will have in most cases their portfolios and presses with them, a comparison of these will be easy, and a discussion of the subject generally will result in much advantage to the fraternity, in bringing about uniformity of action and in saving of money and time. A full account of what botanists may expect at Buffalo will be given in our July number.

THE BOTANISTS of the country may well ask themselves if they take the interest in the government support of botanical work that the importance of the matter deserves. We venture to say that barely a dozen botanists outside of Washington are aware that the "Botanical Division" and "Mycologic Section" of the Department of Agriculture are purely hypothetical departments without official recognition. To be sure the commissioner is allowed a botanist and assistant botanist, and the work goes on the same as in the days when there was an officially recognized Botanical Division, but not much growth can take place under these conditions. Did the law-makers appreciate the important relations of modern botany to the economic interests of the country, we feel sure the work would be more liberally supported; and it is not to be overlooked that the law-makers must more or less directly catch their inspiration and learn what is required from the botanists themselves. This is forcibly brought to mind by the bill which is now (April 20) before the House of Representatives, for the annual appropriation for the work of the Department of Agriculture. The Commissioner recommended for botany, including the study of plant diseases, about one-third of the amount named for entomological work, or exclusive of salaries one-fifth as much; while the bill as reported by the committee, and as it now stands (it may be modified before its final passage) gives one-ninth as much, or exclusive of salaries one-fiftieth—that is, admitting that one-half of the one thousand dollars allotted to the support of the "museum and herbarium" will be used for the latter. The urgent necessity for the investigation of plant diseases is ignored; although "the loss from contagious diseases of animals is a mere bagatelle in comparison," as a correspondent puts it, it is liberally provided for, as it should be. Botanical science as a factor in the wealth and welfare of the nation needs more earnest advocates to gain for it the recognition it merits.

THE APPOINTMENT of Mr. Bernhard E. Fernow as chief of the forestry division of the Department of Agriculture seems to have been a move in the right direction. Mr. Fernow, who has had practical and theoretical training as a forester, has already begun actively an attempt to enlist the help of botanists in the study of forest problems. He proposes, as far as possible, to assist those who are working or will work in this line, "and to publish and distribute in

pamphlet form as their work, over their name, such monographs as they may prepare." The plan commends itself to us as a good one, and with proper precautions likely to result in effective work in this division. One investigation, in which almost all botanists can assist, is the contemplated series of phenological observations. Blanks (and further information) can doubtless be obtained by any of our subscribers who will express a desire for them.

OPEN LETTERS.

Seeds of Mentzelia.

Can any botanist send me seeds of Mentzelia ornata, in good condition for germination? JOHN M. COULTER.

Crawfordsville, Ind.

Liquid Glue for mounting plants, etc.

Glue, half pound; acetic acid, half pint. Break the glue into small pieces, put it into the acid and set it on the back part of the stove for a few hours, and then it is always ready for use. Cork it up in a bottle and it will keep any length of time. Good to put the back on books, etc.

Paola, Kan. DR. J. H. OYSTER.

Arrangement of Herbaria, etc.

Professor Beal's inquiry in the April GAZETTE prompts the following reflections:

After a trial of both plans, I have come to use the alphabetical arrangement of genera and species, arranging the orders according to Bentham and Hooker. To facilitate the arrangement in the approved sequence, whenever this becomes temporarily necessary for any order, I pencil the number of both order and genus under the name on the genus-cover, following the Genera Plantarum, thus.cc. 4. This arrangement is followed in cryptogams, as well as phænogams, though the numbering is obviously impossible with the former.

An alphabetical or numerical sequence is at best a compromise, for convenience of reference. In an herbarium it is less objectionable than when applied to notes and references. Some eight years ago, when I began an extensive specific subject-index in certain branches of botany, I arranged my cards alphabetically. There is no question but those referring to a given genus are found most readily with this arrangement, but this is not all of the story. In studying the pollination or other biological features of a genus, or the fungi that attack it, it is always necessary to consult the slips on related genera. With the Genera Plantarum before us, we can pick them out, in an alphabetical index, but it is far better to find them in proper sequence, and as rapidly as possible my cards are being arranged according to the natural system. With the experience of Dr. Gray, I am not at all sure that I shall not wish my genus covers were similarly arranged, as his are. However, the task of rearranging them is less onerous than that of rearranging a large index.

A word as to exsiccatæ. Some time since Professor Bessey stated in the *Naturalist* that such collections of fungi as Ellis, Roumeguère and Winter are best divided and the species distributed where they belong, in the herbarium. I think this will ultimately prove a source of annoyance to those who try it, for without a perfect system of cross-references the species of some groups will soon become inaccessible in consequence of the frequent removals they experience from genus to genus in this changeable group. With occasional indexes

these collections are as useful as books, which no one thinks of cutting up and distributing in his herbarium. WILLIAM TRELEASE.

Shaw School of Botany, St. Louis, Mo.

Prof. Beal, in the April number of the GAZETTE, desires the experience of others in the arrangement of the herbarium. My practice is about parallel to his. In the college herbarium in my charge, the arrangement is by Bentham & Hooker for orders and genera. In my private herbarium, kept at my house, and hence subject to incessant consultation, I arrange my orders as above, but where the order is a large one, place the genera in alphabetical sequence. While this is much the most convenient way for ready reference, I know that in my own case I lose by it something of familiarity with the generic affinities. With a too faulty memory one is apt to acquire an alphabetical rather than an actual notion of the relations of things. W. WHITMAN BAILEY.

Brown University, Providence, R. I.

Adopting the suggestion made by Prof. Beal (April GAZETTE, p. 98) that the experience of others in herbarium arrangement would be of interest, I note the methods found most expedient in the herbarium at the National Museum.

The genera are all arranged in the cases according to the *Genera Plantarum* of Bentham and Hooker. Pasteboard "flaps," labeled with the contents of each compartment, serve to direct the search for any particular genus, and this is all that is required, for one working constantly about an herbarium soon learns where, approximately, everything is. But the species are all arranged alphabetically, and it is found to be of the greatest convenience. Originally some of the larger genera were arranged systematically, after some monographer (the oaks and Junci after Engelmann, the willows after Bebb, etc.), but this was found to be cumbersome in the extreme, and was abandoned. In a large herbarium like this, where a genus is often represented by from fifty to two hundred species, no method as satisfactory as the alphabetical has been proposed. F. H. KNOWLTON.

National Museum, Washington, D. C.

CURRENT LITERATURE.

Tendril Movements in Cucurbita maxima and C. Pepo. By. D. P. Penhallow, Am. Jour. Sci., Jan., Feb. and Mar., 1886.

Under this title Prof. D. P. Penhallow gives the results of more than 400 complete observations upon the tendrils in motion. During the process of the development of the tendril, a variety of movements are noted and remain to be accounted for. These are: (1) torsion, which, contrary to Sachs, is easily shown to exist in tendrils of Cucurbitaceæ, (2) circumnutation, (3) effects of irritation, (4) spasmodic movements at end of activity, (5) coiling about a support, and (6) free coiling. Believing that all these motions are but varied phenomena of plant growth, dependent upon the same conditions, experiments with the vine, the terminal bud, and the fruit were entered upon, that the conditions governing growth in general might be made the basis of tendril investigation; and for the peculiar manifestations in the tendril, reference was made to its histological structure and the accepted theory of the continuity of protoplasm.

The squash tendril is composed of the following tissues: the central pith, which gradually breaks down at maturity; a ring of wood bounded by one of parenchyma, beyond which lies the most important region, that of the collen-

chyma tissue, extending to the epidermis—its continuity broken at three well-defined points by large-celled parenchyma.

These three parenchyma regions can be recognized on the surface of the tendril, as dark green bands extending through its length on the upper side and on the right and left. Among these the greatest growth occurs in turn without regular order, and here the activity longest remains. The name vibrogen is applied to these bands, as designating their importance in the circumnutation and coiling of the tendril.

Unequal growth in the wood, the collenchyma and the vibrogen produces unequal tension in these tissues, hence resulting movements of the whole body. It has been demonstrated by Sachs and Darwin that a band of rapidly growing cells traveling around the circumference of an organ is sufficient to account for the phenomenon of circumnutation, but a study of the irregular figure described by the squash tendril shows that recourse must be had to the vibrogen for explanation of the movement here, particularly as it appears from investigation that the horizontal movements are twice as great as the vertical ones, a fact depending upon the peculiar distribution of the three vibrogen bands.

Torsion is produced by the rapid growth of the vibrogen bands not followed by a corresponding growth elsewhere.

Irritation upon the surface of the tendril, particularly in the region of the collenchyma least broken by the parenchyma, *i. e.*, the lower surface, causes cessation of growth and condensation of structure, hence a bending toward the irritating surface. The same is true when coiling results from contact with a support.

When mechanical irritation is applied at any part the impulse is conveyed from cell to cell through the continuity of protoplasm which is best demonstrated in the collenchyma tissue.

The other movements enumerated are also explained upon similar grounds, and the manifestation of these movements in tendrils alone is accounted for by the localization of the vibrogen bands, the disproportion between length and diameter, the great flexibility of the organ and the greater effect of unequal tension when exerted longitudinally through a filamentous structure.

GRACE E. COOLEY.

Handbook of Plant Dissection. By J. C. Arthur, C. R. Barnes, and J. M. Coulter. Henry Holt & Co., New York. 1886. 12°. pp. 256. 2 plates.

The aim of this volume has been to provide for instructors and students a detailed account of a series of representative types illustrating the different groups of the vegetable kingdom from the lowest to the highest. As the title implies, it is not a general treatise to which the student is to go for information, but a practical handbook to be used in the laboratory while examining common plants, such as can be obtained anywhere at the proper season. In general the plan is that of Huxley and Martin's Elementary Biology, but the species selected for study are different. The Thallophytes are represented by five, the Archegoniata by three, and the Phænogams by four species. The student is supposed to begin with Protococcus viridis, a plant more easily obtained in quantity than P. fluvialis, and better adapted than the yeast plant for showing the typical structure of the vegetable cell. Each chapter starts with a short account of the general appearance and mode of collecting the plant to be examined. There then follow minute directions for studying the gross and minute anatomy, and at the end of the chapter the student's attention is drawn to the relation of what he has seen to the structure of the vegetable cell and the phenomena of plant growth and reproduction in general. In an introductory chapter is a short account of the apparatus and reagents needed in the laboratory.

There is a great need of a book like the present, for the number of persons who wish to study botany by what we may call the type-plan is already large and increasing. In a work of this kind the temptation is to include too much

and make a small encyclopædia rather than a working handbook. The authors have happily escaped this difficulty and given us a book of convenient form with all the necessary information condensed in a small space. There is a great but unwise demand for plates in books of this sort, but, not to mention the necessarily high cost of a book with numerous good plates, it seems to us better that a laboratory handbook should not contain plates, but, if plates are required, they can better be provided in the form of charts or atlases.

The selection of plants to be studied is a good one and large enough to occupy the student's time for several months at least. We would suggest, however, that it might have been well to add some common lichen like Physcia stellaris, for the biological relations of the lichens are important and likely to interest the student. The proportions of the book are to be commended, for, although a greater number of species of Thallophytes are presented, the space devoted to that group is less than half as great as that devoted to Archegoniata and less than a third of that assigned to Phænogams. By the arrangement adopted, the student starts by observing a few things, and as he advances and becomes more proficient he can work more exhaustively.

If it is necessary to train the observing powers of students, as is almost always the case at the present time, there is, of course, a danger that a handbook like the present may be abused and that the student may rely too closely on the directions given. In the preface, the authors call attention to the possibility of such an abuse and make the important suggestion that, if a teacher finds that his class are following the handbook blindly and not using their own eyes, he should substitute other species nearly related botanically to those given in the book. The directions for work would apply as before, but the student would have to work out details for himself. W. G. FARLOW.

Vorlesungen über Bacterien. Von A. de Bary. Leipzig: Wilhelm Engelmann, 1885. pp. 146. 18 woodcuts. 8°.

It is within a year that the author published a brief treatise upon bacteria as part of his *Morphologie und Biologie der Pilze Mycetozoen und Bacterien.* The present work follows to some extent the same line of treatment, but of course is more complete, touching upon many themes not permissible within the compass of the previous work. It is also, for the most part, in a more simple and flowing style, which comes from the matter having first been given in a series of lectures.

The author does not attempt to provide a treatise devoted to particularities regarding all cases of interest and importance, a "bacteriology," but to afford a general survey of the subject which may enable one to find his way intelligently among the multiplicity of details. As one can not properly see the city for the houses, or the forest because of the trees, unless a commanding position be obtained, so it is in the mazes of this new science. This is the great service which the author has done, to point out in a masterly way the true relation of the facts to one another, and to bring the whole into harmony with the other departments of biology.

The following is an outline of the contents of the book. The use of the words bacteria and fungi is discussed. The structure of the bacterian cell, the forms of cells and of cell-families, and their development are successively treated. When the author points out how simply the different forms of the single cells of bacteria may be illustrated, he more deeply enlists the interest of the student who is at the same time an instructor. He says: One may separate them into round-celled forms and two rod-forms, straight and spiral. A billiard ball, a pencil and a corkscrew represent these three forms with much accuracy, so that expensive illustrative models are not needed.

The whole work has been presented with much perspicuity; it has also been divested of that remoteness and strangeness with which we are wont to regard the subject. This has been done by tracing many analogies with familiar facts pertaining to higher vegetation. In speaking of the necessity

of taking into account the modes of grouping in order to be able to distinguish between such minute objects, he says that "in the phenomena of grouping there appear specific characters which must, indeed, be present in the single cells, but with the means at our command can not be recognized or only with difficulty, yet, as it were, become cumulative in larger masses. This is, however, nothing peculiar. Of cells, which in comparison with bacteria are enormously large and richly organized, we can not say with certainty, when they are presented singly, whether they belong to a lily or to a tulip plant. In their natural combination or grouping, however, the one always goes to build up the tulip only, and the other the lily, and herein we know that they are different."

Probably one of the most interesting parts of the book to the general reader is the fourth chapter, which deals with the *pro* and *con* of the existence of species among bacteria, and their affinities and position in the system. There are some kinds of plants, the author says, in which there is a constant recurrence of the same forms with relatively small individual variation. Most of the common higher plants and animals are examples of these, as well as many low, simple kinds. With some practice one can name them from single pieces dissociated from their developmental connection. A horse chestnut may, *e. g.*, be determined from a single detached leaf. Other kinds of plants are pleomorphic, subject to many changes of form, partly from external and partly from internal causes. In contrast to the horse chestnut the white mulberry produces very dissimilar leaves, some simply cordate, others lobed and cut. One would not be able to determine the species from the last, if he had previously only seen the cordate form. Among lower plants pleomorphism is not confined to bacteria, but is common among the algæ and fungi. The pleomorphic species differ from the relatively simple forms, therefore, only in their more varied development; the characteristics of species do not the less occur in them than in the others. There was no question regarding true species among bacteria for 150 years after their discovery; the controversy was introduced by Cohn when he published his memorable classification of growth forms.

So we might continue to give the author's views regarding these form-species, the errors which have arisen by inattention to details of manipulation in performing cultures, even by such noted investigators as Nägeli and Buchner, and the systematic affinities and peculiarities of the bacteria. These and many other topics will prove of great interest to the biologist.

The fifth chapter considers the occurrence and distribution of bacteria, followed by processes of growth, relations to the substratum, parasites and saprophytes, important examples of the latter described, the phenomena of parasitism, harmless parasitic kinds in warm-blooded animals, relation of bacteria to infectious diseases of animals and plants, which takes us to the end of the fourteenth chapter. A bibliography of important works and a name register closes the volume.

The importance of a work like this is not easily overestimated. It may not bring out many new facts, but it places those which are already known in their true light, and makes clear the real position of the science.

The Methods of Bacteriological Investigation. By Dr. Ferdinand Hueppe. Translated by Hermann M. Biggs, M. D. New York: Appleton & Co., 1886. 8°. pp. 218. 31 woodcuts.

Die Methoden der Bakterien-Forschung. Von Dr. Ferdinand Hueppe. 3d ed. Wiesbaden: C. W. Kreidel, 1886. 8°. pp. 244. 2 colored plates and 40 woodcuts.

This work by Dr. Hueppe was written at the request of Dr. Koch, the most renowned of bacteriologists, whose name imparts a guarantee of value to the book. It does not, however, stand in special need of a sponsor, for the most casual examination shows it to be superior to any work upon technological

methods yet issued. The subject is presented in a careful, well-balanced, well-digested form, not encumbered with unnecessary diffuseness and not marred by too great attention to pathological and omission of non-pathological details. Investigations in bacteriology, in order to carry weight, must be conducted with a full appreciation of the absolute need of refined manipulation, and their completeness depends upon a knowledge of the numerous ways in which they may be conducted and of the ends to be attained by each process. This work admirably meets the requirements of a safe and practical guide to both the student and the specialist.

Some of the topics treated are the principles of sterilization, direct examination of bacteria, uses and methods of staining, pure cultures, cultivation in fluids, fractional and dilution methods, opaque and transparent solid cultures, slide, plate and test-tube cultures, determination of the causal relation of bacteria to decomposition and disease, septic and parasitic bacteria, the effects of temperature, pressure, gases, and electricity upon bacteria, how to study the bacteria in earth, air and water. Many other topics are also considered, but an enumeration of all of them would still fail to give a just idea of the book's real value, which lies to a considerable extent in the admirable manner in which each topic is treated.

Some fault might be found with the translation, but as the defects do not affect the truthfulness of the work, so far as noticed, they may well be left to the captious. The American publishers have done their part of the work well, although the matter has been spread over one-fourth more space than in the German edition. The two fine colored plates are omitted, but a useful index is added.

The German work was published in February, 1885. It ran through two editions, and in November, 1885, a third much improved and augmented edition was prepared, but was not received in time for the translator to make use of it. This third edition adds seventy pages of new matter and nine new woodcuts. The additions are scattered throughout the work, upon nearly every page, the most considerable being descriptions of Fol's sterilizing kettle, Chamberland's porcelain filter, apparatus for sterilizing and cultivating at constant temperatures below 75° C., other forms of culture vessels and inoculating instruments, additional nutrient solutions, and the principles of staining. The four pages of the original work upon the classification of the bacteria have been nearly tripled and entirely rewritten. The colored plates illustrate slide, plate and test-tube cultures, cultures on opaque solid media, and staining for several purposes.

Bacteriological studies in America can not fail to receive a decided impulse from the advent of this admirable work, and we shall not be surprised to find that new editions are demanded often enough to keep pace with the growth of technic.

NOTES AND NEWS.

THE *Western Druggist*, published in Chicago, has a good botanical department, edited by Prof. E. S. Bastin.

AN INTERESTING article on Peziæ by J. B. Ellis is given in the April number of the *Journal of Mycology*.

DR. GOODALE is giving a course of semi-weekly lectures before the Woman's Education Association of Boston.

IN THE JUST established Buffalo College of Pharmacy, Dr. D. S. Kellicott has been appointed professor of botany and microscopy.

A WORK on the forms of bacteria and their relation to genera and species has been published by Dr. Hueppe, and is reviewed in this number.

THE APRIL number of the *Journal of Microscopy and Natural Science* contains a sketch of Charles Darwin, being an address by H. W. S. Worsley-Benison, F. L. S.

DR. VASEY in the *Bulletin of the Torrey Botanical Club* records finding tubers on Hydrocotyle Americana. They were oblong, and from a quarter to half an inch long.

DR. J. H. OYSTER, of Paola, Kansas, has just lost by fire all the copies of his "Catalogue of the Plants of America." Next winter he proposes to publish a new edition.

GARTENFLORA, of March 15, contains a notice of Dr. Gray's seventy-fifth birthday, and also an outline of his life, taken from the biographical sketch in the January GAZETTE.

AN EXPLANATION of the mechanical causes of the various methods of æstivation is attempted by K. Schumann in *Berichte* der deutschen botanischen Gesellschaft, iv. 53-68.

AUG. SCHULZ records a case (Ber. d. deut. bot. Gesell. iv. 52) in which the outer walls of certain epidermal cells of Salicornia herbacea were found to separate entirely from the side walls.

FROM THE report of the Montreal Botanic Garden we learn that there are 197 known botanic gardens. Germany has 34, Italy 23, France 20, Great Britain and Ireland 12, West Indies 6, United States 5.

PROF. J. L. BUDD, of the Iowa Agricultural College, has issued a bulletin of 64 pages, containing revised lists of fruits, trees and shrubs from N. E. Europe, that have been on trial on the college grounds.

THE READERS of the GAZETTE will be interested in the complimentary dedication of a new genus of grasses to the well known American agrostologist, by Prof. Hackel of Austria, especially as its first publication is made through an American journal.

THE JOURNAL of the New York Microscopical Society has reached the end of its first year. The editor, Mr. Braman, who has managed its publication with marked success, finds it necessary to resign. The journal is deserving of ample support.

WE WOULD CALL attention again to the sections of the leaves of Abietineæ, to be obtained of Rev. J. D. King, of Fall River, Mass. They are admirably mounted and stained and are well calculated for a critical study of these peculiar leaf structures.

PINUS ENGELMANNI has turned up again. Forty years ago Wislizenus collected in the mountains of Mexico a single specimen, which is now in the Berlin herbarium. Good specimens of leaves and cones have lately been received at the Gray herbarium.

THE ALGA, Pithophora Kewensis, first found in a lily tank at the Kew Gardens and supposed to be tropical, has been found by Mr. Wolle, Mr. Balen and others in several localities in eastern United States, according to the *Journal of the N. Y. Microscopical Society*.

SOME MARKED DIFFERENCES in the structural character of the flowers of different varieties of the apple are illustrated and described by Dr. W. J. Beal in the February number of the *American Naturalist*. It is suggested that such characters might well be used in horticultural descriptions of varieties.

MR. JOHN MACOUN of the Survey of Canada is on a visit to Europe. Before leaving this country he completed the writing of Part III of the Catalogue of Canadian Plants, which carries it through the Coniferæ. This part will also include an addendum bringing the whole work up to date, and a complete index.

A LARGE COLLECTION of Scandinavian mosses belonging to the late J. E. Zetterstedt is for sale, either in sets or by single specimens. The first series of 209 specimens is offered for seven dollars, or specimens may be selected for less than five cents each. The specimens and labels are in envelopes unmounted. Address, Dr. H. Wilh. Arnell, Jönköping, Sweden, using either English, French or German.

THE BACTERIOLOGICAL EXAMINATION of drinking water is attracting much attention, and the remarks of Dr. Theobald Smith before the Biological Society of Washington, printed in the *Amer. Microscopical Journal* for April, are timely. Before unskilled investigators publish results they should carefully peruse this article, and not unwittingly bring such work into disfavor by overlooking the simple fact that the germs of water are largely innocuous, and that the detection of disease germs in drinking water is at present extremely difficult.

DR. JULIUS RÖLL, of Darmstadt, is publishing in *Flora* an extended paper, "Zur Systematik der Torfmoose." The Sphagna present a well worked but always tempting field for study, especially tempting to German systematists, as they exhibit almost interminable variations and give abundant opportunity for the description (if not discrimination) of innumerable varieties, forms and subforms.

IN THE *Bulletin of the Torrey Botanical Club*, for April, Mr. Douglas H. Campbell describes (with plate) the development of the antheridium in ferns, the observations being principally upon Asplenium filix-femina, Onoclea Struthiopteris, and O. sensibilis. In the same issue Dr. George Vasey proposes eight new species of Gramineæ and two new varieties, six of which belong to the genus Agrostis.

THE SIZE of the bordered pits of coniferous wood is found by Rev. J. L. Zabriskie* to be quite constant in the same species, but to have up to a hundred per cent. variation among different species. The largest examined are those of the sugar pine (Pinus Lambertiana) and the smallest of the canoe cedar (Thuja gigantea). The former are about $\frac{1}{100}$, and the latter about $\frac{1}{200}$ of an inch in diameter.

WE DO a good service to all teachers and students of botany by calling their attention to the announcement of the summer course at the Botanic Garden of Harvard University. The course as planned is an admirable one, and all who have heard Dr. Goodale lecture know how attractive morphology and physiology become in the hands of a master. Mr. Sargent lectures on cryptogams, and directs the laboratory work.

THE BOTANICAL DEPARTMENT of the University of Nebraska has been receiving some excellent additions in the way of books and exsiccatæ, as we learn from the students' journal, *Hesperian*. Among the books are full sets of the Annales des Sciences Naturelles, Pringsheim's Jahrbücher für wiss. Botanik, Boott's Illustrations of Carex, and Bentham's Flora Australiensis. The exsiccatæ include some 14,759 species belonging to over twenty different publications.

WINTER STORMS often result in an enormous destruction of buds. Last winter, at Cambridge, Mass., during a wind storm of almost unprecedented severity and of five days duration, the snow was thickly covered with buds switched off the elm trees by the thrashing branches. These fallen buds collected under the lee of walls and walks in piles. The number lost from each good-sized tree must have been in the thousands, yet the trees seem in no wise the worse as they unfold their leaves this spring.

IN THE *Journal of Botany*, for April, Mr. J. G. Baker has begun a synopsis of the Rhizocarpeæ. In this first part the genera Salvinia and Azolla are included, the former with thirteen species, the latter with five. No species of Salvinia is recorded from North America, but there are five in South America, six in Africa, of which three are peculiar to Madagascar, one in Asia, and one (S. natans) common to Europe and Asia. The five species of Azolla are tropical, but one (A. Caroliniana) extends into the United States.

A BOTANICAL CLUB has been organized in Utica, N. Y., and bears the name "Asa Gray Botanical Club." The name is peculiarly appropriate, both from the position of the botanist whose name it commemorates, and also because the club is situated in his native county. It numbers 24 members at present and has an organization like that of the Torrey Botanical Club, and from the spirit shown we prophesy for it a successful future. Its officers are Dr. J. V. Haberer, President; Miss Phelps, Vice President: Prof. George C. Hodges, Secretary; Rev. Wm. B. Coleman, Treasurer; Mr. W. P. Shepherd, Curator.

DR. W. G. FARLOW gives some notes on certain vegetable parasites found offish in the *Bulletin of the U. S. Fish Commission* for February 8. One of these is Clathrocystis roseo-persicina of Cohn which causes the reddening of codfish and which has been identified with that on red fish in France, and presumably the same as said to have caused sickness of soldiers in Algiers who ate red fish. Sarcina morrhuæ of Farlow has been found associated with it upon our coasts, and has recently been identified with S. litoralis found by Poulsen on mud in Denmark. The latter name has precedence. The third species is Oidium morrhuæ of Farlow.

*Jour. N. Y. Micr. Soc., I, p. 218.

AN ACCOUNT of some highly interesting experiments "On the transpiration-stream in cut branches," by Francis Darwin and R. W. Phillips, is given in Proc. Camb. Phil. Soc. v. 330–367 (1886). These experiments were undertaken to help decide between the two theories as to the place of the stream of water which supplies the loss by transpiration, viz: whether the chief and essential path of this stream is in the *walls* of the wood-elements or in their *cavities*. The results favor strongly the latter view. The apparatus used by them for measuring transpiration is so simple and with proper precautions so accurate that a description of it will be useful to teachers of physiology. It consists of a large T-tube placed in this position ⊢. The now horizontal limb is bent up so as to be parallel to the vertical one. The upper end of this bent limb is to receive the branch to be experimented on. The upper end of the straight limb is closed with a rubber cork, while from the lower descends, through a rubber stopper, a capillary (thermometer) tube 30–40 cm. long. The whole apparatus is now filled with water and the experimental branch attached by means of a short piece of rubber tubing. The severing of the branch and attaching it to the T-tube must be done under water as in all such experiments. The apparatus is now to be supported in an upright position with the capillary tube dipping into a cup of water supported on a low block. After a few minutes remove the cup and allow a bubble of air to enter the lower end of the capillary tube. This index bubble must be of equal length in all experiments and must be allowed to travel to a mark 10 cm. up the tube before readings commence. These readings consist of the rate at which the bubble traverses from this point a fixed length of tube, say to its upper end. The time of travel must be recorded by a stop-watch or other device for measuring accurately fractions of seconds. The reciprocals of these times give a series of figures proportional to the amount of water absorbed by the branch in a given time. Particular care must be taken to prevent leakage at joints and stoppers.

M. LÉO ERRERA'S results (Berichte d. deut. bot. Gesell, iv. 16–18 [1886]) from a study of the transpiration-stream also militate against the imbibition theory. His experiment is simple and adapted to the lecture table. An injection mass is prepared, consisting of gelatine 20 parts, water 100 parts, to which is added enough Chinese ink, well-rubbed up, to render the mass black. This mass melts at 33° C. and solidifies at 28°. Leafy twigs of any plant with large vessels (Errera used Vitis vulpina) are to be severed from the plant, one in the air, another under water, and a third under the just-melted gelatine mass. The latter is then to be quickly plunged into cold water, and a fresh surface made by removing a thin slice from the previous cut. Thus the vessels are closed (as can readily be seen) with the black gelatine, but the walls of the wood-elements are exposed to the water. All having been placed in water, the injected twig soon wilts and can be shown, by measuring the water, to absorb vastly less (not $\frac{1}{30}$ in the experiment with Vitis) than even the twig cut in air. The wilted twig can, however, be revived, if within half an hour the gelatine-filled portion be cut off.

A CAREFUL and sympathetic sketch of the life of John Williamson, botanist and artist, written by R. M. Kelley, and illustrated with a portrait, several decorative designs, and a half-dozen photographic reproductions of his etchings, is given in the *Southern Bivouac* for March. The writer had good opportunity to learn the story of his life, and presents it in very full and interesting detail. Williamson was noble-minded, ambitious, and undaunted. In spite of most unpropitious circumstances he achieved a lasting reputation, especially through his ferns etchings. These are unexcelled, having received the commendation of no less an authority than Philip Gilbert Hamerton for their artistic excellence, and of many botanists for their scientific accuracy.

THE APPROPRIATION BILL for the Department of Agriculture for the year 1886–7, which has been recommended to Congress by the House committee on agriculture contains a number of items which should interest botanists. One will naturally look first for the Botanical Division, and will doubtless be surprised to find there is none recognized. There is, however, a Microscopical Division, for which an appropriation of $1,000 is asked; but this is evidently not botanical, as the money is to be expended for chemicals, fibers, investigations into adulteration of food, and for salaries. The experimental gardens and grounds, which ought to be of real value to the botanical and economic interests of the country, are allotted $24,450, besides which there is $2,000 for the introduction of foreign medicinal plants. The Seed Division—all know what that is—asks for $108,240; forestry is allotted $10,000; for the purchase of entomological, botanical, chemical, mineralogical, agricultural and other works and periodicals for the library $1,500; for collecting and preparing material for museum and herbarium $1,000. This covers all appropriations in any way affecting botany, except the salaries of the botanist and assistant botanist.